

HOW TO USE THE POWER PORTS: INTRODUCTION

Each active Space Experiment Module (SEM) contains a Module Electronics Unit (MEU). This is the power control and data acquisition system for the module experiment. The MEU has a total of nine power ports available to the experimenter.

HOW TO USE THE POWER PORTS: ELECTRICAL INTERFACE

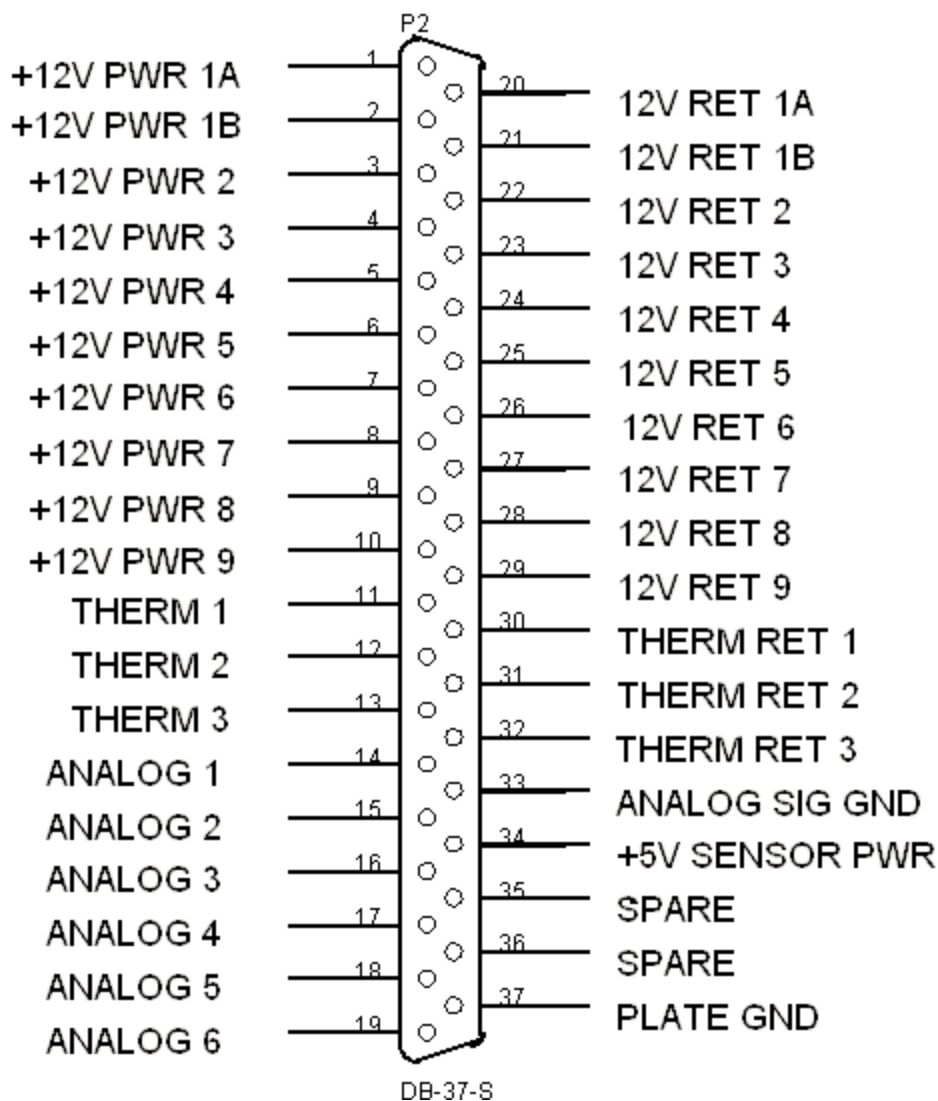


Figure: Experimenter Connector Pin-out

Table: Experimenter Connector Signal

Pin No.	Signal Name	Signal Description	Limits
1	+12V PWR 1A (Port 1)	12V Power Output	2.5A maximum
2	+12V PWR 1B (Port1)	12V Power Output	2.5A maximum
3	+12V PWR 2 (Port 2)	12V Power Output	1A maximum
4	+12V PWR 3 (Port 3)	12V Power Output	1A maximum
5	+12V PWR 4 (Port 4)	12V Power Output	1A maximum
6	+12V PWR 5 (Port 5)	12V Power Output	1A maximum
7	+12V PWR 6 (Port 6)	12V Power Output	1A maximum
8	+12V PWR 7 (Port 7)	12V Power Output	1A maximum
9	+12V PWR 8 (Port 8)	12V Power Output	1A maximum
10	+12V PWR 9 (Port 9)	12V Power Output	1A maximum
11	THERM 1	Experiment Thermistor 1	0 to +5 VDC
12	THERM 2	Experiment Thermistor 2	0 to +5 VDC
13	THERM 3	Experiment Thermistor 3	0 to +5 VDC
14	ANALOG 1	Experiment Analog 1	0 to +5 VDC
15	ANALOG 2	Experiment Analog 2	0 to +5 VDC
16	ANALOG 3	Experiment Analog 3	0 to +5 VDC
17	ANALOG 4	Experiment Analog 4	0 to +5 VDC
18	ANALOG 5	Experiment Analog 5	0 to +5 VDC
19	ANALOG 6	Experiment Analog 6	0 to +5 VDC
20	12 RET 1A (Port 1)	Port 1 Power Return	Used with +12V PWR 1A
21	12 RET 1A (Port 1)	Port 1 Power Return	Used with +12V PWR 1B
22	12 RET 2 (Port 2)	Port 2 Power Return	Used with +12V PWR 2
23	12 RET 3 (Port 3)	Port 3 Power Return	Used with +12V PWR 3
24	12 RET 4 (Port 4)	Port 4 Power Return	Used with +12V PWR 4
25	12 RET 5 (Port 5)	Port 5 Power Return	Used with +12V PWR 5
26	12 RET 6 (Port 6)	Port 6 Power Return	Used with +12V PWR 6
27	12 RET 7 (Port 7)	Port 7 Power Return	Used with +12V PWR 7
28	12 RET 8 (Port 8)	Port 8 Power Return	Used with +12V PWR 8
29	12 RET 9 (Port 9)	Port 9 Power Return	Used with +12V PWR 9
30	THERM RET 1	Thermistor 1 Return	Used with THERM 1
31	THERM RET 2	Thermistor 2 Return	Used with THERM 2
32	THERM RET 3	Thermistor 3 Return	Used with THERM 3
33	ANALOG SIG GND	Analog Signal Ground	Used with ANALOG 1 - 6
34	+5V SENSOR PWR	+5V Sensor Power 1	0 Milliampere (mA) max.
35	SPARE	SPARE	Do not use
36	SPARE	SPARE	Do not use
37	PLATE GND	Plate or Chassis Ground	Single Point Ground

HOW TO USE THE POWER PORTS: ELECTRICAL REQUIREMENTS

This section details the requirements for Space Experiment Module (SEM) experimenters using a Module Electronics Unit (MEU) (i.e. active modules). These requirements will be needed in the hardware design phase of the experiment.

Power and Ground

It is important to properly connect to the MEU power ports.

Each Power Port has its own power return (or ground). It is important to use the corresponding returns with each power port.

Power Returns should not be tied to other power returns, Plate Ground, any of the Thermistor Returns, or the Analog Signal Ground.

Low impedance Power Port loads (current above 10 milliamperes (mA)) should not return through the Plate Ground, any of the Thermistor Returns, or the Analog Signal Ground.

Plate Ground (chassis) may not be used as a return or ground.

The Plate Ground must connect to the experimenter mounting plate at one location only.

Current Capacity

At no time should the experiment exceed the MEU current capacity. The MEU power ports are not automatically current limited. SEM has several layers of over current protection to protect the carrier flight hardware. The following are the maximum limits.

Power Port 1 can source 5.0 Ampere (A) maximum only when using two 20 (AWG) wires pairs (i.e. +12V PWR 1A and +12V PWR 1B pins along with 12V RET 1A and 12V RET 1B).

Power Port 1 can source 2.5A maximum only when using one 20 AWG wire pair (i.e. +12V PWR 1A or +12V PWR 1B pins along with 12V RET 1A or 12V RET 1B).

Power Ports 2 through 9 can source 1.0A maximum only when using one 20 AWG wire pair (i.e. +12V PWR 2 and 12V RET 2).

HOW TO USE THE POWER PORTS: POWER BUDGET

Each module is allowed to consume a maximum of 5 amps per hour of energy from the Space Experiment Module (SEM) battery. This is the limit for the total power used by all the power ports. It is very important to not exceed this limit since everyone shares the energy in the SEM battery. The SEM ground software will help manage the power consumption budget. It is the experimenter's responsibility to ensure that correct current usage values for components are entered into the Experiment Data File (EDF) and that the 5 amps per hour is not exceeded.

HOW TO USE THE POWER PORTS: BUILDING THE ELECTRICAL POWER SYSTEM

Wiring

All wiring must be Teflon® insulated. The only exceptions are the short leads that can not be replaced off devices such as motors or solenoids. Teflon® insulated wire also has the advantage of not melting or burning when accidentally contacting a soldering iron.

Wire Sizes

- All power wires must be 20 Gauge (20 AWG or #20 wire) Teflon® insulated wire.
- All signal wires must be either 22 or 20 Gauge Teflon® insulated wire.

Harness Routing to MEU

The experimenter wiring should be neatly bundled using tie wraps (available at Radio Shack and other places).

MEU Interface Electrical Connector

Experimenters must provide their own 37-pin 'D-type' connector with male pins to mate to the Module Electronics Unit (MEU) and Ground Module Electronics Unit (GMEU). The connector must use crimp pins. An inexpensive crimping tool is available at Radio Shack. Crimp pins may be soldered to wire leads (before inserting into connector). Soldering the pins after crimping to the wire is recommended unless machined pins are used with the proper tool.

Potting

Do not pot (glue) the wiring at the back of the connector to the MEU. Potting is normally used on the back side of a connector to prevent leads from coming out of a connector and provides some limited strain relief. The connector needs to be accessible for the safety inspection. NASA will pot the connector after the safety inspection using a flight approved material.

Backshells

Connector backshells of all kinds are not permitted. The connector needs to be accessible for the safety inspection. In addition, the space in the module where the connector mates to the MEU is very limited. By eliminating the backshell it makes it much easier for technicians to integrate the experiment into the module without having to alter any of the experimenter's wiring.

Screw Locks

Experimenters must provide male screw locks for the 37-pin connector. Screw locks generally come in kits with all the necessary hardware for one connector (i.e. two retaining clips and two #4-40 screws).